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(54) CHANGE-OVER VALVE, AND REGENERATIVE COMBUSTION APPARATUS AND REGENERATIVE HEAT EXCHANGER USING SAME

UMSCHALTVENTIL, UND DIESES VERWENDENDE REGENERATIVE VERBRENNUNGSVORRICHTUNG UND REGENERATIVER WÄRMETAUSCHER

VANNE DE PERMUTATION, APPAREIL DE COMBUSTION A RECUPERATION ET ECHANGEUR DE CHALEUR DE RECUPERATION UTILISANT CE DISPOSITIF

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and low temperature gas flow countercurrently and exchange their heat through the heat exchanger column 130. The housing 129 is partitioned at equal intervals in the peripheral direction by the partition boards the same as in the foregoing embodiments, and the other constitution is the same as in the foregoing embodiments. The shaft holes 106, 106g, auxiliary partition walls 110, 110g, and rotary tube joints 107, 107g may be omitted.

[0103] The invention is applied not only in the regenerative catalytic combustion apparatus and regenerative heat exchanger, but also in other uses in a wide range.

[0104] In the embodiments shown in Fig. 1 through Fig. 20, the catalyst 54 and pretreatment material 141 may be omitted. In other embodiments, only the pretreatment material 141 may be omitted.

[0105] The flow directions of the objective gas and clean gas may be opposite to the directions as shown in the above embodiments.

TECHNICAL APPLICABILITY

[0106] Thus, according to the invention, the fluid passing through the pair of chambers formed in the valve box may be continuously changed over and may flow into the passage of each stationary valve port formed by the passage forming means including the partition boards at the stationary valve member side.

[0107] Especially, according to the invention, the third moving valve port is formed at one side between the first and second moving valve ports along the peripheral direction, and hence undesired mixing of gas between the first and second moving valve ports can be prevented by purging gas or the like.

[0108] Further, according to the invention, at the other side between the first and second moving valve ports along the peripheral direction, the changeover part 138 extending in the peripheral direction so as to close at least one stationary valve port is provided in the valve disc, and hence fluid such as gas is smoothly changed over in the passage of each stationary valve port respectively communicating with the first and second moving valve ports, so that the fluid can be passed in all passages, and the operation efficiency is excellent.

[0109] Another excellent effect of the invention is that the sealing between of the moving valve member and stationary valve member can be composed easily.

[0110] By realizing the regenerative combustion apparatus by using such rotary distribution valve, the fluid such as objective gas containing malodorous substances can be operated continuously by rotating and driving the valve disk of the rotary distribution valve without moving the heat reserve material. Hence, all advantage of the rotary type regenerative combustion apparatus can be exhibited, that is, the purging area is essentially minimized, the structure may be reduced in size, and the heat reserve material is substantially decreased, which also contributes to reduction of the structural size.

[0111] Also according to the invention, the structure of the rotary distribution valve is simple, and the high temperature gas does not pass away, and adverse effects of thermal distortion can be eliminated.

[0112] In the invention, it is not necessary to rotate and drive a heavy heat exchanger column, but only a light valve disc may be rotated and driven, and the structure is simplified and reduced in size, and hence the facility cost can be saved. The same effects are obtained when the rotary distribution valve is applied in the regenerative heat exchanger.

[0113] According to the invention, moreover, the temperature of the catalyst and the pretreatment material for removing the catalyst deteriorating substances is prevented from becoming too low, so that the action of the catalyst and the pretreatment material may be exhibited sufficiently.

[0114] Further according to the invention, communicating holes consisting of a porous plate having multiple pores opposite to the space in which the heating means is provided are formed, and hence the gas is mixed sufficiently in the space, and uniform temperature distribution is achieved, and thus obtained purified gas having uniform temperature is conducted into the catalyst, pretreatment material, and heat exchanger column, and the heat is accumulated.

[0115] In the invention, since the purging gas can pass only through one of the passages 84, 113 to 120 partitioned by the partition boards 55 in the housing 52, the remaining passages 84, 113 to 120 can be used effectively for passing the objective gas or passing the purified gas, and the effective volume of the heat reserve material, catalyst, and pretreatment material can be increased, and hence the efficiency is high. Moreover, since the purging gas is supplied into one of the passages 84, 113 to 120, the structure of the rotary distribution valve 51 can be simplified. Furthermore, since the purging gas is supplied only in to one of the passages 84, 113 to 120, the required flow rate of purging gas can be reduced. In addition, this purging gas is, for example, a clean air at ordinary temperature, and by allowing the purging gas to pass only in one of the passages 84, 113 to 120, it is possible to restrain undesired cooling of the heat exchanger column 53 and hence drop of temperature.

Claims

1. Rotary distribution valve comprising:

- a valve box (64) including a first and a second chamber (65, 66) superposed in the axial direction, each chamber (65, 66) being provided with a connection port (61, 62), respectively,
- a rotatory valve member (67) accommodated in the valve box (64) so as to be rotated about the axis (63), wherein first (86, 87) and second (88, 89) moving valve ports (86, 87; 88, 89) are formed at positions facing the second chamber (66) on the one end of the valve box (64) in the axial direction at intervals in the peripheral direction about the axis (63), and a third moving valve port (90) is formed either between the first (86) and second (89) moving valve ports or between the first (87) and second (88) moving valve ports in the peripheral direction.

a guide space (91) for communicating the first chamber (65) with the first moving valve ports (86, 87) is formed by partition walls (70) provided in the second chamber (66), the guide space (91) is partitioned from the upper chamber (66) which communicates with the second moving valve ports (88, 89),
a communicating passage (111) which communicates with the third moving valve ports (90) is formed by an auxiliary partition wall (110), and
said rotatory valve member (67) has a changeover part (138) expanding in the peripheral direction between the other first (86, 87) and second (88, 89) moving valve ports, so that at least one of the stationary valve ports (82) may be changed over distinctively,

characterized in that

- the rotatory valve member (67) comprises a first valve disc (69), a second valve disc (92) and the partition walls (70) connecting the first valve disc (69) with the second valve disc (92),
  said first valve disc (69) is provided with the first (86, 87) and the second (88, 89) valve ports and the third valve port (90) is formed in said first valve disc (69) either between the first (86) and the second (89) valve port or between the first (87) and the second (88) valve port,
- a stationary valve member (71) is disposed at the one end of the box (64) adjacent the first valve disc (69) and provided with a plurality of stationary valve ports (82) disposed in the peripheral direction around the axis (63) and
- the guide space (91) for communicating the first chamber (65) with the first valve ports (86, 87) in the first valve disc (69) is formed by a part of said partition walls (70a, 70c) and by said second valve disc (92) which is provided with communicating holes (93),
- whereby first gases are fed through the connection port (61) into the chamber (65), through the passages (86, 87) in the rotatory valve member (67) and through the corresponding passages in the stationary valve member (71) and the second gases are fed through the remaining passages in the stationary valve member to the corresponding passages (88, 89) in the rotatory valve member (67).

2. Rotary distribution valve according to claim 1, characterized in that the rotary valve member (67) has a rotary shaft (68) rotating about the central axis (63),

the rotary shaft (68) has a shaft hole 106, which communicates with the communicating passage (111) and with a rotary tube joint (107).

3. Rotary distribution valve according to claim 1 or 2, characterized in that the first valve disc (69) is vertical to the central axis (63) and comprises a changeover part (138) and

seal members (97, 98, 101, 102) sliding on the opposite surface of the stationary valve member (71) and extending in the radial direction among the first, second, and third moving valve ports (86, 87; 88, 89; 90).

4. Rotary distribution valve according to claim 3, characterized in that a first angle in the peripheral direction of the pair of seal members (97, 98) at both sides in the peripheral direction of the third moving valve port (90) is supposed to be $\theta 1$,

each stationary valve port (82) is formed by a second angle $\theta 2$ in the peripheral direction,
the interval of the mutually adjacent stationary valve ports is formed by a third angle $\theta 3$ in the peripheral direction, and
these angles have the relations of

$$\theta 2 + \theta 3 \geqq \theta 1 \geqq \theta 2,$$

and

$$\theta 3 \geqq \theta 2.$$

5. Rotary distribution valve according to claim 4, characterized in that the relation of $\theta 3 > \theta 2$ is satisfied.

6. Rotary distribution valve according to claim 4, characterized in that a pair of auxiliary seal members (99, 100) are provided at both sides in the peripheral direction of the seal members (97, 98) and

the angle $\theta 6$ of these auxiliary seal members (99, 100) is selected to satisfy the relation of:

$$\theta 2 + 2\,\theta 3 \geqq \theta 6 \geqq \theta 2.$$

7. Rotary distribution valve according to claim 4, characterized in that the seal members (101, 102) provided between the other first and second moving valve holes (86, 87; 88, 89) along the peripheral direction, out of the seal members (97, 98, 101, 102) are disposed in the changeover part (138) at an angle $\theta 4$, being selected in the relation of

$$\theta 4 \fallingdotseq \theta 2.$$

8. A regenerative combustion apparatus comprising:

(a) a housing (52),
(b) a heat exchanger column (53) accommodated in the housing (52),
(c) a catalyst (54) for burning polluted gas, provided above the heat exchanger column in the housing (52),
(d) partition boards(55), extending vertically in the housing (52), for forming plural passages (84, 113 to 120) by partitioning the heat exchanger column (53) and the catalyst (54) at intervals in the peripheral direction, and communicating with a common space in the upper part of the housing, and
(e) a rotary distribution valve (51) according to one of the claims 1 to 7 provided beneath the housing (52),
(f) the lower part of the rotary distribution valve (51) is fixed to the stationary valve member (71),
(g) the polluted gas is supplied into either one of the chambers (65), and purified gas is conducted in from the remaining chamber (66),
(h) a clean purging gas is supplied into the communicating passage (111) in the same flow direction as that of the polluted gas, and
(i) the rotatory valve member 67 is rotated by a rotation drive source in a direction of the purging gas being changed over and passed, in the plural passages (84, 113 to 120) through which the polluted gas passes.

9. Combustion apparatus according to claim 8, characterized in that a heating means (59) is provided in the upper space of the housing,

a space partition wall (56) for forming the space (57) is fixed in the upper part of the housing,
communicating holes (58) for individually communicating with the plural passages (84, 113 to 120) partitioned by the partition boards (55) are formed in the space partition wall (56), and
the communicating holes (58) are disposed above at a clearance from the upper part of the catalyst (54), and are formed by a porous plate having multiple discrete pores.

10. Combustion apparatus according to claim 8 or 9, characterized in that a pretreatment material (141) is interposed between the heat exchanger column (53) and the catalyst (54) in order to remove the catalyst (54) deteriorating substances contained in the polluted gas, and

the catalyst (54) mainly composed of a base of honeycomb material, and the pretreatment material (141) has a specific heat of about 0.1 kcal/°C or less.

11. Combustion apparatus according to claim 10, characterized in that the pretreatment material (141) is composed of a corrugated base.

12. Combustion apparatus according to claim 9, characterized in that a pretreatment material (141) is interposed between the heat exchanger column (53) and the catalyst (54) in order to remove the catalyst (54) deteriorating substances contained in the polluted gas, and

the catalyst (54) mainly composed of a foamed metal material and the pretreatment material (141) are combined.

13. Combustion apparatus of any one of claims 10 to 12, characterized in that means for controlling the heating means (59) is provided so that the temperature of the pretreatment material (141) may be 250 °C or more.

14. Combustion apparatus according to claim 8, characterized in that,

the passage forming means (71, 52, 55) comprise
the stationary valve member (71) fixed to the valve box (64) opposite to the rotary valve disc (69), the stationary valve member possessing the stationary valve ports (82) overlaying on the first, second, and third moving valve ports (86, 87; 88, 89; 90) and
means (52, 55) for forming the plural passages (84, 113 to 120) by individually communicating with the stationary valve ports (82) of the stationary valve member (71).

15. A method of operating a regenerative combustion apparatus according to one of the claims 8 to 14, characterized in that,

the polluted gas is supplied into either one chambers (65), and purified gas is conducted in from the remaining chamber (66),
a clean purging gas is supplied into the communicating passage 111 in the same flow direction as the polluted gas,
the valve disc (67) is rotated by a rotation drive source in a direction of the purging gas being changed over and passed, in the passages (84, 113 to 120) through which the polluted gas passes, and
the polluted gas passes through the communicating hole (58) at about 5 to 20 m/sec.

16. A regenerative heat exchanger comprising:

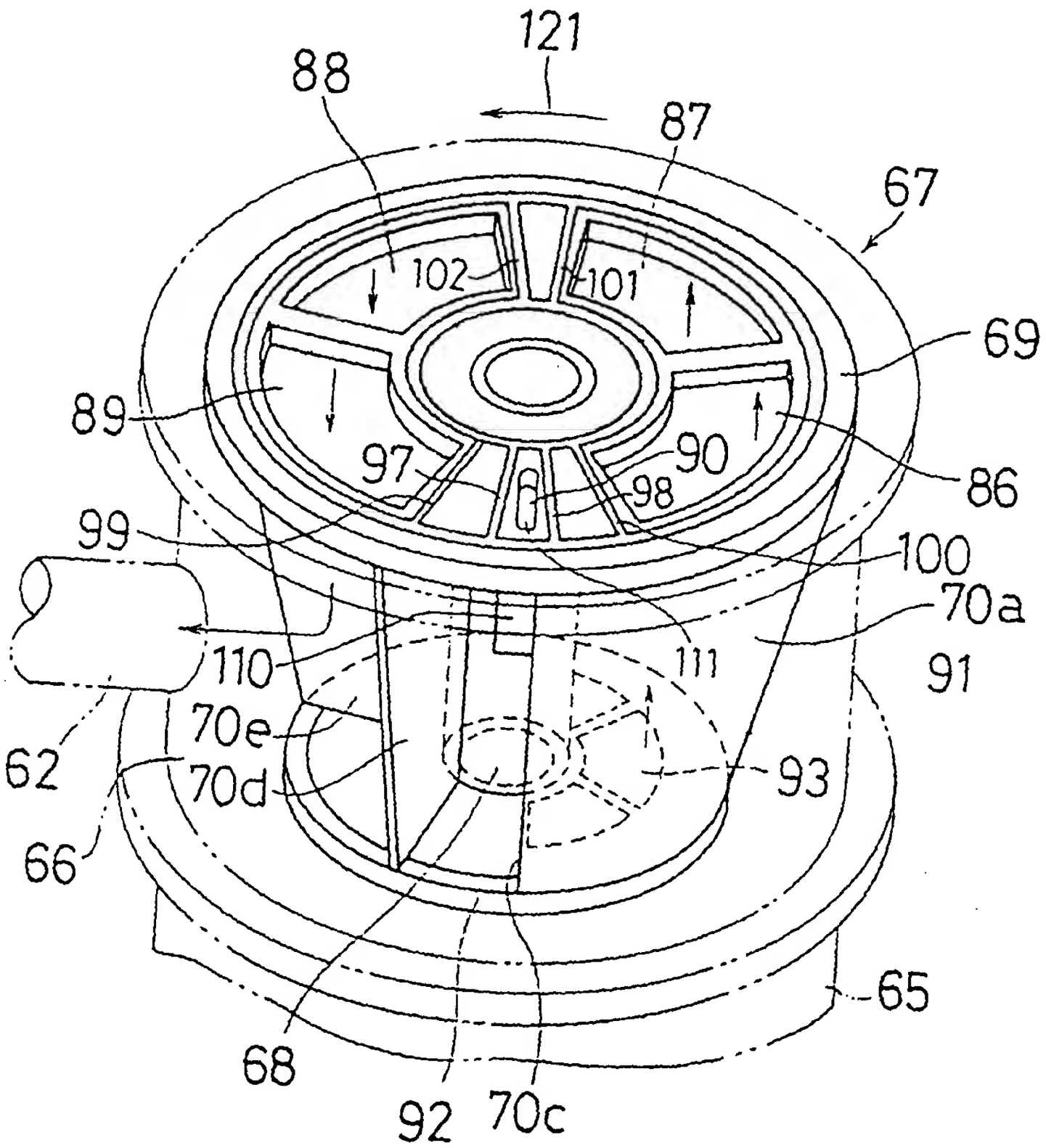
(a) a housing (52),
(b) a heat exchanger column (53) accommodated in the housing (52),
(c) partition boards (55), extending vertically in the housing (52), for forming passages by partitioning the heat exchanger column (53) at intervals in the peripheral direction, and
(d) first and second rotary distribution valves (51, 51g) provided above and beneath the housing (52), each one of the rotary distribution valves (51, 51g) being according to one of the claims 1 to 7
(e) both ends in the axial direction of the partition boards (55, 55g) are fixed to stationary valve members (71, 71g),
(f) rotary shafts (68, 68g) of the rotary distribution valves (51, 51g) are driven in cooperation,
(g) high pressure gas is supplied into either chamber (65) of the first rotary distribution valve (51), and is conducted into either chamber (65g) of the second rotary distribution valve through heat exchanger column (130), and
(h) low temperature gas is supplied into the remaining chamber (66g) of either the first or second rotary distribution valve (51g), and is conducted into the remaining chamber (66) of the other first or second rotary distribution valve (51).

Patentansprüche

1. Drehverteilventil mit:

- einem Ventilgehäuse (64), das eine erste und zweite Kammer (65, 66) in Axialrichtung übereinanderliegend enthält, wobei jede Kammer (65, 66) eine Anschlußöffnung (61, 62) aufweist,

Fig. 5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